

proximity of Africa and the Seychelles being relatively few. The marine fauna and flora was markedly richer than even at Coetivy.

Of other work, we have taken about sixty dredgings off the islands we visited down to more than 800 fathoms, and tow-nettings at various depths to more than 1000 fathoms. We have consequently rich collections, but obviously no estimate of them can be at present formed. We have also serial temperatures in a series of positions, and water samples have been taken throughout down to various depths. Magnetic observations have also been secured at intervals along the line between Madagascar and the Seychelles.

As we are now leaving H.M.S. *Sealark*, I would like to express our great indebtedness to Commander Boyle T. Somerville and every officer and man on board for their great kindness and most cheerfully rendered assistance to Mr. Forster Cooper and myself. Nothing has seemed too great or intricate or small for them to undertake, from a complicated survey to the repair of delicate instruments or dredges. The weather throughout the voyage—the season chosen was governed by considerations relating to hurricanes—has been, generally speaking, most unsuitable and unpleasant, but work has nevertheless gone on almost continuously. All regular survey work, sections across the islands, soundings, magnetic, tidal and temperature observations, &c., have been done by Commander Somerville and his officers. Mr. Beer, the artificer engineer in charge, and his staff have been indefatigable in eking out the coal, on which our movements necessarily depended to a large degree, and in effecting the not inconsiderable repairs connected with such a long cruise away from regular ports. The artificers (carpenter, blacksmith, and armourer) have never failed over the varied and unusual work which they have at times been called upon to undertake, and, finally, every individual hand has been splendid in giving of his very best to assist the expedition to success.

J. STANLEY GARDINER.

FORESTRY IN BELGIUM.

THE Royal English Arboricultural Society paid a visit to the Belgian forests on August 12-22. The Belgians, like ourselves and all other European countries, except Scandinavia, Russia, Austria, and some of the smaller States near the Black Sea, have insufficient woodlands to supply the timber that is necessary for their requirements. In 1840, Belgium imported 187,920*l.* worth of timber, but in 1893 the imports were valued at 4,677,880*l.*, together with about 1,200,000*l.* of wood-pulp and other articles manufactured out of wood, such as matches, gun-stocks, masts, furniture, bark, &c. The annual exports of wood from Belgium are now valued at 600,000*l.* only, so that there is an annual deficit of timber production in the country amounting to more than 5,000,000*l.*

The Belgian Government is dealing with this deficit in the most statesmanlike manner, by using all available means for increasing the production of timber, by improving the management of the existing woodlands, and by planting their waste-lands.

The areas of woodlands in Belgium, according to the agricultural statistics of 1895, are as follows:

Nature of proprietor	Area in acres
State	62,600
Communes	395,455
Public establishments	17,380
Private owners	828,300
Total	1,303,735

The area of forests in Belgium is therefore about one-sixth of the total area of the country.

The small area of the Belgian State forests is chiefly due to the fact that, between 1815 and 1830, when the country was united to Holland, the Government sold all the

State forests, and the present area of State forests has been bought back from private owners through the wise policy of the first king, Leopold I.; this has been continued recently by the present Government, which purchases suitable private woodlands whenever they are for sale.

In 1850 there were the following areas of waste-land in Belgium; I have not been able to obtain more recent figures:

	Acres
State	17,140
Communal	145,267
Private	423,322
Total	585,729

Since 1897 the State has been acquiring waste-lands and re-planting them, 212,960*l.* having been so invested up to date, and land to the extent of 15,317 acres having been acquired and planted.

The State has no power of compelling communes to plant their waste-lands, but important subsidies are granted by the State to encourage them to do so. The Forest Department also organises annual sylvicultural conferences with the object of inducing communes and private owners to utilise their waste lands. This has been so successfully managed, that in the province of Luxemburg, where there were in 1847 126,000 acres of waste-land, by the end of 1887 only 42,000 acres of waste remained in the province, the balance having been converted into 49,000 acres of arable land and pastures and 35,000 acres of woods.

In the space of this short article it is impossible to do more than give a mere sketch of the interesting woodlands recently visited by the Royal English Arboricultural Society in Belgium. It would interest British municipalities, such as those of Liverpool and Leeds, that are engaged in planting the catchment areas of their waterworks, to see the immense tract of woods that cover the catchment area of the Gileppe, a stream rising in the Ardennes and feeding a large reservoir, constructed between 1869 and 1898, to supply water for the population that carries on the extensive woollen industry in Verviers and the other hamlets lower down. The planting with spruce of the Hautes Faynes, or peat district of the Hertogenwald, at altitudes between 1600 and 2160 feet, which is being carried on at the rate of 1000 acres annually, is a vast and highly original work, the rapidity and excellence of which merit careful study.

Plantations of Austrian pine on the very dry and hot Devonian limestone rocks, near Rochefort, supply valuable wood as pit-timber, and afford shelter and increased moisture to the neighbouring farms. The domain of Mirwart, belonging to an Antwerp family named von der Becke, and managed by Dr. Schlich, where millions of spruce and other trees have been planted to replace 32,000*l.* worth of inferior timber that was cut out between 1892-1902, was also visited. Here, forty acres of Scots pine, now thirty years old, has already yielded in thinnings, since 1891, 11*l.* per acre net, while in another eight years, when the whole will be felled as pit-timber, it will yield 64*l.* per acre, or a total return, including thinnings, of 75*l.* per acre.

The domain of Chenoy, belonging to Mr. Boël, contains magnificent beech, oak, and ash standards over coppice. The underwood is sold as pit-timber. Oak trees containing 100 to 140 cubic feet (solid measure) are not uncommon, and some of the ash standards are quite as large. These trees sell standing at 2*s.* and 2*s.* 6*d.* per cubic foot. Abeles (*Populus alba*) up to 80 feet in height are not uncommon, and sell at 9*d.* per cubic foot. It is a curious feature of these woods that whenever the aspect is south or west, the poor Tertiary sandy soil (Bruxilien), from which the fertile superficial loam has been washed, will yield only pines or birch, while immediately the aspect changes to north or east, and the loam remains *in situ* over the sand, splendid broad-leaved woods are produced. In the valleys, Silurian rock crops out from below the sand, all the usual intermediate strata being absent. There we saw a considerable area of Scots pine wood, about forty years old, the trees of which are being pulled up by their roots by a machine, "La

déracineuse Lobo." This operation costs 4d. per tree uprooted; but the poles are thus a foot longer than those that are simply felled, and the roots are used for fuel, while the land can be at once planted, without waiting three years from fear of the pine-weevil (*Hylobius abietis*), which otherwise breeds in the stumps, and then destroys the young crop planted to replace the felled trees.

The last forest visited by the society was the Forêt de Soignes, one of the most magnificent beech forests in Europe. The oldest crops consist of columnar beeches 130 years old, 130 to 140 feet high, averaging 4½ feet in girth at chest height, and containing per acre 7000 cubic feet (quarter-girth measure). This forest of 10,210 acres yields a net annual revenue of 18,000l. for timber alone; the game, chiefly roebuck, rabbits, and pheasants, is fully worth 4s. an acre, but is retained for the King.

The geographical arboretum at Tervueren merits special attention. Here, 75 acres of good undulating loamy land, with a crop of small oak and other saplings, which serve as a shelter-wood, are being planted with exotic trees. The whole area is subdivided into the Old and New Worlds, and each of these into smaller sections, representing countries running from north to south. Thus the "New World" is first subdivided into the Pacific and Atlantic regions, and the former into Alaska, Rocky Mountains, Pacific coast region, and Chile. The Atlantic region into Canada and the Alleghany Mountains. The Old World comprises Northern, Central, and Eastern Europe, Siberia, Caucasus, the Himalayas, Japan, and N. China.

In each of these regions the characteristic trees, broad-leaved and conifers, are planted in their natural mixture. It is also intended to plant among them the shrubs and herbaceous plants that naturally grow with the trees, and this has already been done for Japan. Mr. Bommer, the curator of the Botanic Museum at Brussels, is in charge of this arboretum. He has an extensive forest nursery where he rears the necessary plants. This bold and scientific design is due to the initiative of the King of the Belgians, who has presented the State with the splendid domain of Tervueren, the management of which he still controls.

The Director-General of Forests, Mr. Dubois, has certainly organised the administration of the Belgian forests in a remarkably progressive way, and the system he has adopted in Belgium is probably more suited than those of France and Germany for the future development of forestry in Britain.

W. R. FISHER.

THE CAPE GEOLOGICAL SURVEY.¹

THE presentation of the ninth annual report of the Geological Commission of the Cape of Good Hope will be welcomed by all interested in the prosperity of one of our oldest colonies in Africa. We have been so long accustomed to see similar surveys started and then abandoned before sufficient information had been obtained to yield permanent results that we were afraid that the publication of this report might possibly have been postponed. The past record of surveys of Cape Colony has, indeed, been a dismal one, so hampered have they been in their prosecution, so undervalued have been the results. Fortunately, necessity knows no law, and there are few portions of Africa which do not possess a more or less fully equipped geological survey.

A considerable amount of new and useful knowledge was obtained in Cape Colony during 1904, though the results are not so complete as they doubtless would have been if lack of funds had not prevented the continuation of the survey in important areas, but where the cost of hired transport was found to exceed the limit of the grant voted for the survey.

In the introduction by the director the main results obtained during the past year are recorded, but all too briefly. How little is known of the different rock groups even in these southern and best known regions of Cape

Colony is shown by the discovery of a new set of rocks, termed Nieuwervst series, which are found to be newer than the Ibiqus and Malmesbury series, but older than the Table Mountain Sandstone. The succession in southern Cape Colony, the type region for South Africa, is thus being brought into closer approximation with that of northern Cape Colony and the Transvaal, with a result that cannot fail to be beneficial to both. Further, a closer parallelism is found to exist between the geological history of South Africa and the southern continents than zoologists and geologists dared to hope, but on which each alike confidently felt would be the case.

In the detailed account Mr. Rogers describes the geology of the north-western part of Van Rhyns Dorp. Among the Malmesbury beds a characteristic feature consists of the abundance of crystalline limestones intercalated between slates and phyllites. The account of the intrusive granites and the metamorphic rocks with the associated sillimanite-cordierite schists contains much of interest. The Ibiqus series and the unconformably overlying Nieuwervst series deserve close attention, owing to the light they will probably throw on the Transvaal succession.

In the district of Long Kloof Mr. Schwarz finds the geology to be highly complicated by folding. A somewhat fanciful explanation is offered to account for the elevation of the mountains in this area being no greater than in the less folded regions composed of the same rocks.

In the description of the geology of Aliwal North, Herschel, Barkly East, and part of Wodehouse, Mr. du Toit enters into much detail concerning the stratigraphy and composition of the Upper Karroo beds and the volcanic phenomena associated with them. A great addition to our knowledge of the sedimentary and volcanic beds of the Stormberg series will here be found. By means of the special reptilian contents in the upper portion of sandstones, red and purple shales, mudstones and clays, it has been found possible to subdivide the great thickness of the Beaufort series. For this superior group the term Burgersdorp beds is proposed. Besides their abundant reptilian contents, they are further interesting from the occurrence of *Lepidodendron* in association with *Glossopteris* and *Thinnfeldia*.

In the succeeding Stormberg period chief interest is centred in the careful description of the volcanic outbursts, more especially of that of the volcanic necks. Of these, thirteen are recorded from Wodehouse, twenty from Barkly East, and twenty-two from Herschel, those in Aliwal North being left for further investigation. The description includes most reasonable hypotheses for the formation of the different types of rock infilling the necks. The immense flows of lava and numerous dolerite intrusions receive due attention, the intrusion of the dolerites being placed somewhere between the Middle Jurassic and Lower Cretaceous.

Questions of economic importance will be found to have been thoughtfully considered. It is disappointing to find that so far the coal seams met with in Aliwal North and Herschel are thin and of less value than in the south.

The introduction throughout the report of black and white geological maps of the areas surveyed with a sufficient number of place-names enables the reader to follow the various descriptions with ease. The absence of headlines, and the want of a copious table of contents, constitutes a drawback to the general reader, particularly where the report deals with petrological descriptions.

Those persons who consider that the work of a national survey should be primarily devoted to the economic aspect of the inquiry will doubtless be disappointed at the apparent poverty of the commercial results obtained by the Survey since the date of its commencement in 1896. The explanation is obvious. A national survey cannot be formed for a particular section of the community interested in the discovery of gold, coal, or diamond fields. It is, however, expected of such a survey, and that of the Cape fully realises the expectation, that the maps and memoirs it publishes should represent the most trustworthy and technical information it is possible to obtain as to the geological structure of the country it professes to examine, and on which the practical man who follows must and does base his conclusions.

W. GIBSON.

¹ Ninth Annual Report of the Geological Commission of the Cape of Good Hope. Pp. 181. 1904. (Cape Town, 1905.)